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Notes upon Uvularia, Oakesia, Diclytra and Krigia.

By Theodor Holm.

(Plates CXI–CXIII).

Uvularia perfoliata and Oakesia sessilifolia.—These two species have been hitherto united in the genus *Uvularia* of Linné, but have recently been separated by S. Watson,* on account of differences in the leaves, whether they are "perfoliate or sessile," the position of the flowers, whether they are "terminal or not," and the structure of the capsule, whether it is "three-lobed or three-winged." There are, however, other characters taken from the rhizome, which are not less important, although they may not even in connection with the above mentioned characters, be sufficient to distinguish them as representing two genera. The descriptions in systematic works of the rhizome of these two plants are generally defective.

A. Michaux† says of the genus *Uvularia* "Radix fibrosa, aphylla," but does not supply any special characters for the rhizomes of the different species. Barton‡ describes *U. perfoliata*, as having "root white, palmate divisions cylindrical, garnished with a few yellowish-white radicles," while he in the second volume of the same work mentions the rhizome of *U. sessilifolia* "Root perennial, fleshy, whitish, resembling the root of *U. perfoliata*." He gives a very good illustration of the species *perfoliata* and figures the anterior part of the rootstock, but without

* Proceedings American Acad. Vol. XIV.

† Flora Boreali-Americana, Vol. I, 1803, p. 199.

‡ Flora of North America, Vol. I and II, 1822.

showing stolons. John Torrey * describes *U. perfoliata* as having "root a tuft of fleshy fibres," and Kunth† says merely "Rhizoma repens" as a character for the whole genus, and we find the same in Darlington's ‡ and Chapman's Manuals §. A more complete description has been given, however, in the sixth edition of Gray's Manual, where *Uvularia* has been characterized as having a "short rootstock with fleshy roots," while "a slender, creeping rootstock" has been attributed to the genus *Oakesia*.

But the fact that *Uvularia* possesses long, subterranean stolons, seems certainly hitherto to have been overlooked.

In *Uvularia perfoliata*, the main rhizome of the full-grown and flowering plant is hardly one line long, and is entirely concealed by the roots. These are whitish, fleshy and cylindrical, thickest at their upper extremity and then taper gradually towards the end; their length is from two to three inches on full-grown specimens, and they are but sparingly branched. Besides this part, the main rhizome, there are regularly two stolons to be observed, one on each side of the base of the flowering stem. Plate CXI, Fig. 1 illustrates the rhizome of an old plant, and we see here the two stolons each with its prophyllum at the very base. This prophyllum is about three lines long, triangular, but sheathing for half of its length. The stolons are covered with long, scale-like leaves, more than an inch in length, which form closed sheaths around the internodes. The apex of these leaves is free, triangular and a little curved. The stolons do not run in a straight line under the surface of the ground, but are slightly bent at each internode. The end of the stolons may strike root and the bud will then develop a new plant, while the other part is entirely destitute of roots and fades away early in the spring. At that time the young plant has been provided sufficiently with roots, similar to those described above, and does not need any longer to be in connection with the old individual from which it has been formed.

Oakesia sessilifolia. The rhizome of this plant is entirely different from that of the preceding. It is relatively long, about six

* Flora of New York, Vol. II, 1843.

† Enumeratio Plantarum, Vol. IV, 1843, p. 200.

‡ Flora Cestrica, 1853, p. 328.

§ Flora of the Southern United States, 1883, p. 486.

inches or even more, and it shows a few stretched internodes. Plate CXI, Fig. 4 illustrates a rhizome of the full grown plant, and we see here that the roots have almost the same size and shape as those of *Uvularia*, but show, however, several ramifications. The leaves of the rhizome are scale-like and clasping, although not sheathing, and the internodes are cylindrical, almost straight. The anterior part of the rhizome carries two scale-like leaves, surrounding the flowering stem, at the base of which two branches are to be observed. The one (Br. 1) is long and has been formed this summer. It consists already of two internodes, and one root has been developed, similar to those of the older part of the rhizome. Another branch (Br. 2) has also been formed, but does not show yet more than one internode, and no roots have been developed. They are both secondary branches, and the main rhizome being a monopodium from its first development until terminated by the flowering stem, has now been changed to a sympodium, while the branches themselves will show a monopodial ramification, until again terminated by flowering stems. These branches of the rhizome will not be developed as stolons, even if it might look so, when we consider the whole rhizome; they show the same form and structure as the main rhizome and will not be separated from this, like the stolons of *Uvularia*.

These two plants are therefore easily distinguished simply by their rhizomes, and we shall see farther that their internal structure also may furnish several good characters. We will then compare the structure of some of the corresponding organs and commence for instance with the roots. As mentioned above these are thick and fleshy in both plants, due to a considerable deposit of starch in the bark. The cells of the epidermis (Plate CXII, Fig. 12) are thin-walled in both species, and the bark, which occupies the greater part of the root, consists of relatively large, cylindrical cells, entirely filled with starch. In regard to these two tissues, the epidermis and the bark, our plants do not show any difference, but if we consider the innermost part of the root, we will see a somewhat different structure. The cells of the endodermis show very thin walls in *Oakesia* (Fig. 8) where also the spots called after Caspary are very distinct in contrast to *Uvularia* (Fig. 7) where the endodermis is thickened. The size of the cells of the

pericambium is also different; it is largest in *Uvularia*. Inside the pericambium we see the fibro-vascular bundles in a number of about twenty in *Oakesia*, but only about ten in *Uvularia*. The groups of phloëm are relatively larger in *Uvularia* and the xylem shows a stronger development in regard to thickness than in *Oakesia*. As regards the stem overground, we shall also here be able to find a few characters. It is solid in *Oakesia*, but hollow in *Uvularia*. The cells of epidermis do not show any difference; their exterior walls are rather thick in both, with a distinct cuticle. A quite strong sheath of mechanical tissue forms a ring around the fibro-vascular bundles, separated from the epidermis in *Oakesia* by only one stratum of bark-cells, while in *Uvularia* there are two distinct strata between the epidermis and the mechanical tissue. This last consists of about five layers in *Oakesia* and but two in *Uvularia*.

On turning to the structure of the leaves, the epidermis shows the following differences: The cells are relatively much larger in *Uvularia* on both faces, and if we consider simply the inferior face, where the stomata are present, the walls of the cells show a more distinct undulation in *Uvularia* than in *Oakesia*. The superior face is perfectly destitute of stomata in both plants. A transverse section of the leaves shows also that the cells surrounding the stomata are much broader in *Uvularia* (Plate CXI, Fig. 5). But otherwise in regard to the interior structure of the leaf, there was not to be observed any essential difference. Figs. 9 and 10, Plate CXII, illustrate a transverse section of the midrib, and we see here in both plants that the cells of the epidermis show rather thick walls with a distinct cuticle, and we find inside an almost collenchymatous tissue of about two strata (Fig. 11). The fibro-vascular bundles are relatively larger in *Oakesia*, and are not surrounded by any mechanical tissue neither in this nor in *Uvularia*.

The anatomical characters of these two plants are then:

THE ROOT.

The cell walls of endodermis are thickened in *Uvularia*.
The cell walls of endodermis are thin in *Oakesia*.
About ten fibro-vascular bundles in *Uvularia*.
About twenty fibro-vascular bundles in *Oakesia*.

The Stem.

Hollow in *Uvularia.*

Solid in *Oakesia.*

There are two strata of bark-cells between epidermis and the mechanical tissue in *Uvularia.*

Only one stratum in *Oakesia.*

The mechanical tissue consists of about two strata in *Uvularia.*

The mechanical tissue consists of five strata in *Oakesia.*

These two species show then quite a considerable difference in regard to their vegetative propagation and tendency to spread. The one, *Uvularia*, has a very short subterranean stem, but long stolons, which are soon able to develop new plants, therefore it occurs always abundantly where it grows. The other one, *Oakesia*, has a long, creeping rhizome without any formation of stolons; this manner of propagation is evidently not as important as the first one, where stolons were present. There is at least not to be observed so large a number of plants growing together as is the case of *Uvularia.*

Diclytra Cucullaria. "A cluster of grain-like tubers, crowded together in the form of a scaly bulb," is the only description which has been attributed to the rhizome of this plant in the sixth edition of Gray's Manual of Botany. It is rather astonishing that nothing more has been remarked upon this subject, the structure of these so-called "tubers" of a plant so common and well-known, as it is among the earliest-blooming of our flora. It does often happen, however, that these common species escape the attention of the botanists, thus they become at once well-known and not known at all; it seems at least to be the case with this plant. We shall see later that our plant does not possess any tubers at all, and that the rhizome shows a very interesting structure; in spite of that the author has been unable to trace the development of it from the very earliest stage of the germination. If we dig up the plant in the early spring, for instance in the month of March, when it is just commencing to bloom, we then see a rhizome, consisting of a number of light rose-colored tuber-like bodies, covered with dark crimson spots and clustered together so as to form a scaly bulb. We shall see farther that the size of these tuber-like bodies is different, there being always a few

which are much larger than the others, but there does not seem to be any regularity in regard to their position on the rhizome, only that there are often two or three of these larger ones situated closely together. We see farther that the vegetative and floral shoots at their base are surrounded by some scale-like, membranaceous leaves. By separating the "tubers" from the rhizome (Plate CXIII, Fig. 14) it is plainly seen to consist of a number of very short branches, some of which are terminated by an inflorescence or carry a few, (two or three,) normal leaves besides the scale-like ones. The roots are scarce, slender and proportionally weak. Now, in regard to the mentioned tuber-like bodies, these, the smaller ones, are almost conical, slightly flattened at their ventral face and shortly pointed, in contrast to the larger, which are distinctly triangular in outline with obtuse edges and show a scar at their apex, which proves that they have carried something. Still there is nothing yet to explain their origin, before we have removed the scale-like leaves. Inside these we shall find, (Plate CXIII, Fig. 15) in their axils, several clusters of minute "tubers," very much like those observed before, but these show at their summit a rudimentary toothed blade, and are nothing but leaves (Plate CXIII, Figs. 16–17) situated on a short axis. At the same time, during the removing of the scale-like leaves the base of the normal ones becomes free and shows nearly the same form as the larger tuber-like bodies, only with the exception that they are in connection with the long petiole and the large, finely divided blade. The large "tubers" represent then merely the base of now partly faded normal leaves.

There is, however, a shorter way to find out the origin of these tuber-like organs, if we will contemplate the plant at an earlier stage. Numerous minute, one-leafed specimens are always occurring around the mature plants, and these, illustrated in Figs. 18–20, are undoubtedly developed from the above mentioned smaller tuber-like leaves, which, as will be shown later, commonly support a very minute bud (Plate CXIII, Fig. 23). It was my first thought that they were developed from seeds and in a secondary stage, probably one year old, but it seems to be the only correct explanation to offer, that they were developed from the small tuber-like leaves. It is also to be pointed out that these drop easily

away from the main rhizome, enclosing at their base an axillary bud. Another reason is, that not a single germinating plantlet was to be found in spite of very careful search at different seasons of the year, and when I later collected the fruiting specimens, no seed was contained in the fruits. Plate CXIII, Fig. 18 shows then a young plant, consisting of an almost globular, tuber-like body, with the characteristic scar at its apex, and supporting a short axis, carrying a large scale-like leaf, inside of which a normal one has been developed. One short root is coming out below the scale-like leaf, while two are to be observed at the base of the older normal one. The number of scale-like leaves seems to vary; we see in Fig. 19 a specimen of the same age, where three are present. And if we will now examine the base of the young normal leaves, as well of the scale-like ones, we shall again find small clusters of tuber-shaped leaves with rudimentary toothed blades (Plate CXIII, Fig. 17). A few weeks later we will see that the young specimens have continued their growth so as to throw off the scale-like leaves, while the base of the normal leaf shows a considerable swelling, forming a tuber-like body, but with the other parts of the leaf still persisting (Fig. 20). Later in the summer, for instance in the month of August, the mature plant has dropped the inflorescences and the normal leaves, the rhizome being the only surviving part. It shows now the same aspect as that figured in Fig. 14, but with the exception that distinct, whitish buds are to be observed among the fleshy, tuber-like leaves. Plate CXIII, Fig. 22 shows a bud surrounded by several of these, of which three have been figured, the others having been removed, but of which the scars show their position upon exceedingly short branches. The bud itself carries four scale-like membranaceous leaves, inside of which there will be developed the following year some normal leaves and probably an inflorescence. And at the same time we will observe that the tuber-like leaves show a minute but distinct cavity at the base which contains a bud (Plate CXIII, Figs. 23 and 24) able to develop an independent plant as soon as it, together with the tuber-like leaf, has dropped from the rhizome.

The true origin of the "tuber-like organs" has then been proved to be rudimentary leaves or the swollen bases of the normal ones.

Our plant shows then a very peculiar structure of rhizome, it being short, densely covered with tuber-like leaves, supporting and partly enclosing axillary buds, able to produce new individuals, and these are therefore very important in the propagation of the species. Three different kinds of leaves are present—tuber-like, scale-like and normal ones. The function of these thickened leaf-bases is undoubtedly the same as the fleshy scales of the monocotyledonous "leek" of *Lilium* for instance, containing large deposits of starch, besides that they by dropping from the rhizome are able to raise new individuals. In regard to the germination, this does not seem to be known, and it would be highly desirable to obtain some seeds so as to study the very first stage of this interesting species. If we might conclude something from the mature plant and reduce the figure of this to the germinating plantlet itself, might we then not suggest a germination with but one cotyledon, like in some species of the closely allied genus *Corydalis*, and that the base of this leaf-like cotyledon would show the same swollen form as that of a normal leaf, and partly enclosing the plumule?

Krigia Dandelion. There are a few interesting circumstances to be observed in the rhizome of this species, which do not seem to have been perfectly known before, and it may not, therefore, be superfluous to describe them a little more concisely. At least in the sixth edition of Gray's Manual of Botany the specific diagnosis does not give any clear explanation of the rhizome, but indicates merely the roots as being "slender and tuberiferous." "Tuberous" roots occur frequently in several families, but "tuberiferous" i. e. by tubers giving rise to new individuals, can not exist, if we will take the expression "tuber" in its proper sense. Roots, forming true bulbs, are on the contrary known and have been mentioned by Warming * as occurring in *Scilla Hughii.* It gave me, however, the impulse to examine the case myself, and the following note is the result of my examination. Several specimens were collected in the vicinity of Washington, where it grows abundantly in shady woods, and all my specimens showed the presence of several true tubers. These tubers, as it will

* Eug. Warming: Smaa biologiske og morphologiske Bidrag. Botanisk Tidsskrift, Vol. II, Series III, 1877–'79, pag. 61.

be shown, do not belong, however, to the roots, but to subterranean stems. Plate CXIII, Fig. 25 shows then the complete rhizome and the leaves of a mature specimen; we see here that the plant has been developed from a large tuber, and that three stolons proceed from the leaf-bearing axis, all of which terminate in tubers.* The tuber has then been formed by the end of a stolon, a manner of propagation which is not uncommon, as for instance in *Cyperus esculentus* and others. The stolons are rather thin, with long internodes, of which the leaves are scale-like and pointed. The direction of the stolons is almost horizontal, and they do not run very deeply under the surface of the ground. The tubers themselves consist simply of but two internodes, the leaves of which are a little larger than those of the stolons, but show, however, the same form. In regard to the shape of the tubers, these are almost globular at a younger stage, but later they are of a nearly oblong shape with the apex acute, formed by a few pointed scale-like leaves. Now, when the tuber is going to germinate, the stolon dies away, and one or two relatively long internodes will be developed from the apex of the tuber, terminated by the flowering scape with a rosette of normal leaves. This is to be seen in Fig. 25, where the plant distinctly shows its offspring from a large tuber, and we see also one long vertical internode between the leafy rosette and the tuber itself. All the roots are confined to this internode, and it looks, certainly, as if it were a tuberiferous root. The stolons do not, however, always terminate in a tuber; in a case figured in Fig. 26, a small leafy rosette has been developed immediately at the end of a stolon, without being preceded by a tuber, and in this same specimen the stolon had been developed in the axil of a scale-like leaf, situated on the underground stem, formed by the large tuber. The plant propagates then easily by tubers and, as mentioned above, all the specimens collected showed only this kind of offspring. There is, however, no doubt that it is able to propagate by seeds also, but the germination has not yet been examined, and might probably show something interesting in regard to the primary root and the first beginning of the formation of stolons.

[*There was a tuber represented in Mr. Holm's drawing on the stolon shown to the left of the figure, but it was accidentally omitted in the engraving.—ED.]

As regards the interior structure of our plant, it is to be remarked that no mechanical tissue was observable, neither in the stolons, the rosette-bearing stem, nor, of course, in the tubers. The tuber contained inulin, forming great sphæro-crystals after being preserved in alcohol, and these occurred principally in the bark. A pith was found in the young tubers, which were perfectly solid, while the older ones were hollow on account of the partial disappearance of the pith. Cork was rather strongly developed in the older tubers, but otherwise there was nothing remarkable to be observed in the interior structure.

Explanation of Plates.

Plate CXI.

Fig. 1. The rhizome of *Uvularia perfoliata*, seen from before, showing the base of the two stolons, S, and four roots, natural size.

Fig. 2. A later stage of the same, showing the bud, B, which in the following year will develop a flowering stem. $\frac{2}{3}$ × natural size.

Fig. 3. The end of one of the stolons of *Uvularia* with the beginning development of a root by R.

Fig. 4. The rhizome of *Oakesia sessilifolia*, seen from above. Br.[1] and Br.[2] are branches. St., the base of the flowering stem from this year, surrounded by two scale-like leaves. R., the roots, two-thirds natural size.

Fig. 5. Transverse section of the inferior face of the leaf of *Uvularia*. Ep., epidermis with a stoma. $\frac{I}{VI}$

Plate CXII.

Fig. 6. Transverse section of the inferior face of the leaf of *Oakesia*. Ep., epidermis with a stoma. $\frac{I}{VI}$

Fig. 7. Transverse section of the interior part of the root of *Uvularia*. B., the bark. End., the endodermis. Pr., the pericambium. Ph., the phloëm. X., the xylem. $\frac{I}{V}$

Fig. 8. Transverse section of the interior part of the root of *Oakesia*. The letters as above. $\frac{I}{V}$

Fig. 9. Transverse section of the median fibro-vascular bundle in the leaf of *Uvularia*. M., mesophyll. Ph., phloëm. X., xylem. $\frac{I}{V}$

Fig. 10. Transverse section of the median fibro-vascular bundle in the leaf of *Oakesia*. The letters as above. $\frac{I}{V}$

Fig. 11. Epidermis and the collenchymatous tissue of the median part of the inferior face of the leaf of *Oakesia*. $\frac{I}{VI}$

Fig. 12. Epidermis of the root of *Uvularia*, transverse section. $\frac{I}{V}$

Fig. 13. Epidermis of the rhizome of *Oakesia*, transverse section, showing the wrinkled cuticule. $\frac{I}{VI}$

$\frac{I}{VI}$ indicates Ocular I, Objective VI.

Plate CXIII.

Fig 14. The rhizome with the leaves and an inflorescence of *Dicfytra Cucullaria* Natural size.

Fig. 15. Part of the same, showing the petioles of two normal leaves (L), and the base of the inflorescence, (I). The scale-like leaves have been removed, and in their axils are clusters of small tuber-shaped leaves to be seen.

Fig. 16. One of these clusters from the axil of a scale-like leaf.

Fig. 17. A tuber-shaped leaf, showing the small rudimentary toothed blade.

Fig. 18. A small specimen, developed from a tuber-shaped leaf, showing the tuberous base of a leaf, of which the petiole has faded, and a short axis, carrying a root, one scale-like and one normal leaf. 3 × natural size.

Fig. 19. A similar plant with three scale-like leaves, surrounding the normal one. 3 × natural size.

Fig. 20. A similar plant, of which the scale-like leaves have dropped, and where the base of the normal leaf shows the tuberous swelling. 3 × natural size.

Fig 21. The base of a normal leaf, in the axil of which clusters of small tuber-like leaves are to be seen.

Fig. 22. Part of the rhizome of a specimen collected in August, showing a bud surrounded by tuber-like leaves.

Fig. 23. One of these tuber-like leaves at the same time, showing the cavity at the base, in which a bud is to be seen.

Fig. 24. The axillary bud, taken out from the cavity, showing two very young leaves.

Fig. 25. A mature specimen of *Krigia Dandelion*, showing the leafy rosette and the rhizome, natural size.

Fig. 26. The rhizome of another specimen, where a stolon has developed a leafy rosette, not being preceded by any tuber, as in Fig. 25. Natural Size.

U. S. National Museum, Washington, D. C. Aug. 1890.

Recent Contributions to the Literature of the Diatomaceæ.

La Structure de la Valve des Diatomees. Dr. Henri Van Heurck. (Annales de la Societé Belge de Microscopie. xiii. 1890).

By the aid of Zeiss's new apochromatic one-tenth inch objective of 1.63 N. A., using monochromatic sunlight, compensating eye-piece and condenser 1.6 N. A., Dr. Van Heurck has produced a series of photographs which go far towards clearing up our ideas of the structure of the diatom valve. From his researches he derives the following conclusions:

1. Diatom valves consist of two membranes or thin films, and of an intermediate layer, the latter being pierced with openings. The outer membrane is very delicate. It is supposed that these membranes are sufficiently permeable to allow circulation by endosmose, though they have no real openings during the life of the diatom.

2. When the openings of the interior portion are arranged in alternate rows, they assume the hexagonal form; when in straight rows, then the openings are square or oblong.

Three phototype plates accompany the article. A very interesting feature is the resolution of *Amphipleura pellucida* into beads. The photograph of *Pleurosigma angulatum* shows that the opinion of the old microscopists was well-founded, and that the alveoles are really hexagonal. Dr. Van Heurck considers that the intermediate beads are produced by bad focusing of the alveoles.

Diatoms—Their Nutrition and Locomotion. J. D. Cox. (The Microscope, x, No. 7).

Ex-Governor Cox has long been a faithful student of the structure and life-history of diatoms, and has contributed several valuable papers upon the subject. In this paper he advances the following ideas:

1. It is not necessary to regard the raphe as a part of the mechanism of nutrition, as the life-sustaining osmotic process goes on through the alveoles, whose imperfectly silicified tissues at top and bottom permit the process of nutrition to go on freely.

2. The raphe is distinctively a part of the locomotive contrivance of diatoms, and it is probably the seat of a line of cilia working in a groove which is a true cleft.

Diatomees fossiles du Japon. J. Brun et J. Tempère. (Mémoires de la Societé de Physique et d'Histoire Naturelle de Geneve. xxx. No. 9).

This is an excellent monograph upon the fossil diatoms found in the cementstein of Sendai and Yedo, Japan.

Accompanying the seventy-four pages of text there are nine phototype plates containing 135 figures.

It is an interesting fact that three of the new species figured in the volume, viz.: *Tabulina Testudo*, *Brunia Japonica* and *Pleurosigma Hungaricum* are also found in the recently discovered fossil deposit at Atlantic City, N. J.

A Revision of the Genus Aulacodiscus, Ehrenberg. John Rattery, M.A., B.Sc., F.R.S.E. Journal of the Royal Microscopical Society, June, 1888.

A Revision of the Genus Auliscus, Ehrenberg, and of some allied

Genera. Same author. Journal of the Royal Microscopical Society, December, 1888.

A Revision of the Genus Actinocyclus, Ehrenberg. Same author. Journal of the Quekett Microscopical Club, July, 1890.

A Revision of the Genus Coscinodiscus, Ehrenberg, and of some allied Genera. Same author. Proceedings of the Royal Society of Edinburgh, Vol. xvi.

Mr. Rattery is entitled to the everlasting gratitude of diatomists for his extended labors in endeavoring to reduce to a system the classification of the many species included in the genera named. The artificial key appended to each will be found of especial value in tracing species. Most diatomists, however, will probably regret that the author did not do more in the way of condensing the number of species.

Le Diatomiste. J. Tempère. Paris.

This is a quarterly journal devoted to the Diatomaceæ. Three numbers have already appeared. Each number is accompanied by two phototype plates. As Prof. Tempère is assisted by such well-known authorities as Messrs. Brun, Cleve, Grove and Peragallo, it is likely that the character of the journal will be well sustained.

In the number for June, 1890, M. Peragallo gives a tabular list of species of *Coscinodiscus* as given by Schmidt, Van Heurck and Castracane, and in parallel columns the synonyms according to Rattery. This table is of especial value, and will save the student much research.

C. H. KAIN.

Salvinia natans (L.) All., in Minnesota.

This very interesting heterosporous pteridophyte is apparently rare in North America. It is reported in the fifth edition of Gray's Manual as probably not occurring in North America, although Pursh is supposed to have found it in Western New York. In the sixth edition this uncertainty is somewhat dispelled by a report of the plant from Missouri, but no authority is given for the station. It is, therefore, an important discovery which this note chronicles, viz., that *Salvinia natans* (L.) All., grows in Sweeney's Twin Lake, four miles west of the city of Minneapolis. Only a few plants have been found and these have been trans-

ferred to a tank in the university plant-house, where they are growing vigorously, and it is hoped will have soon multiplied enough to admit of a distribution. These *Salvinias* were collected early in October, but were overlooked in the first examination of material. Not until they had separated from the mass of *Lemnas, Myriophyllums* and *Potamogetons* with which they were gathered were they noted. Six good-sized plants are at present growing in the tank, double the number that first appeared. The leaves are a trifle smaller than indicated in the figure in Luerssen's *Farnpflanzen*, Vol. III of Rabenhorst's *Kryptogamen Flora*, page 601, otherwise the plants are strictly typical. The lake from which they were collected is in a boggy tract surrounded with trees of *Larix* and hard-wood timber. It is fed from cold springs and rains. Perhaps the smaller size of leaves in Minnesota specimens is due, however, not to the cold lake, but to the time of collection being so late.

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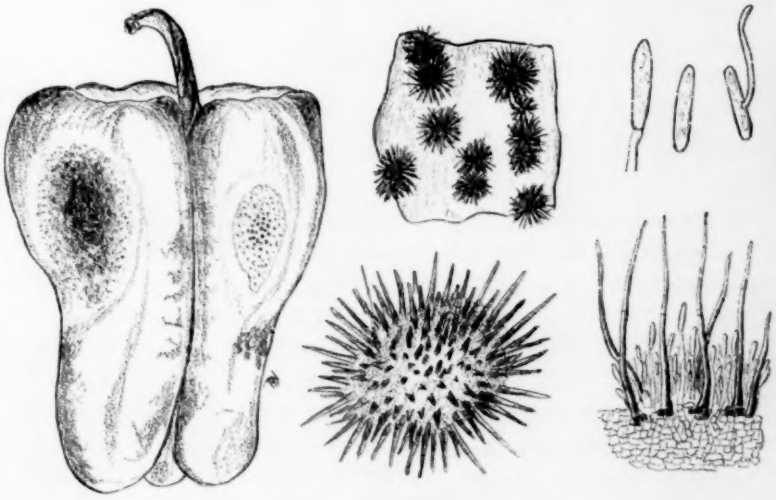
A New Anthracnose of Peppers.

While in Gloucester Co., N. J., during August I observed that the pepper (*Capsicum annuum*) fruit was decaying badly. The pepper is usually attacked near the free end and quickly the fungus spreads in all directions, internally as well as through the thick walls of the fruit. At first the spot is of a grayish color upon the green surface of the half grown fruit, followed by a darkening of the affected portion and often a premature red coloration in the vicinity of the decay. Peppers are grown in large quantities for the Philadelphia and other markets, and in some of the fields the yield is materially reduced by this trouble. Upon some plants the disease is much worse than others and with such sometimes a half dozen fruits may be found in decay.

Upon a microscopic examination of this fungus it was found to be a member of the genus *Colletotrichum* but differing materially from any other in having a great number of large, almost jet black bristles. The following is a description of the bristly anthracnose of the pepper.

Colletotrichum nigrum, Ell. and Hals.—Spots one to two centimeters across, orbicular; central portion black from the abundance of black bristles, margin paler. Acervuli numerous, crowded, erumpent, margined by a circle of long, 100-150μ by 3-4μ black straight bristles. Basidia olivaceous, slender, 15-20μ long. Conidia cylindrical, nearly straight, hyaline, nucleate 20-22μ by 4μ.

In the engraving, upon the left is shown a pepper with the decaying patches, the larger and darker being the older. In the upper center of the engraving is seen a magnified view of a portion of the dark diseased spot with the fungus shown as rosettes, one of the latter being given more highly magnified below. A section through the same is indicated in the lower right hand corner and the spores are shown just above and greatly magnified.

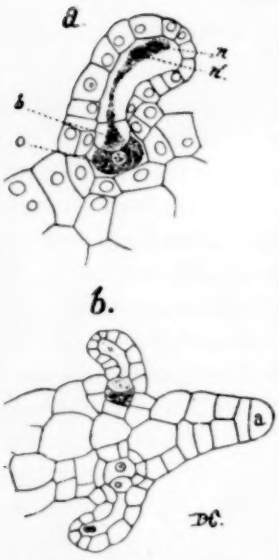


This black *Colletotrichum* must be called the Bristly or Black Anthracnose of the pepper because another anthracnose, namely: *Gleosporium piperatum*, E. & E., has been found during the present season upon the same pungent fruit.

BYRON D. HALSTED.

Rutgers College, Sept. 11, 1890.

Notes on the Archegonium of Ferns.



1. In a memoir on the Ostrich Fern*, published some time since, the statement was made that the ventral canal-cell was wanting. This decision was based on numerous sections of the living prothallium, and has since been found to be incorrect. In microtome sections, (see fig. a.) the ventral canal-cell (b.) is very evident, and is plainly derived from the central cell. In the upper canal-cell, two nuclei may usually be readily seen, but in no cases observed was the cell divided.

2. On sectioning one prothallium, perfectly developed archegonia were noticed both above and below (Fig. b.) and subsequent examination showed numerous other instances of the same thing; in several of these prothallia, embryos developed from archegonia upon the upper surface. Is this a case of reversion to an ancestral form having archegonia above as in liver-worts? Unfortunately the fern from which these came could not be determined.

DOUGLAS H. CAMPBELL.

Bloomington, Indiana, October, 1890.

EXPLANATION OF FIGURE.

a.—Vertical section of the full-grown archegonium of *Onoclea Struthiopteris.*
o.—Central cell of the archegonium.
b.—Ventral canal-wall.
n–n^1—The two nuclei of the upper canal-cell.
b,—Vertical, longitudinal section of a fern-prothallium sp. (?) with archegonia upon both surfaces.
a.—One of the apical cells.

Virginia Creeper.

Many years ago the late Dr. Warder called my attention to the two supposed forms of *Ampelopsis* (see BULLETIN xvii. 269) in

*The Development of the Ostrich Fern, D. H. Campbell, Memoirs, Boston Society of Natural History, 1887.

Ohio, where he occasionally took me to see some illustration of the non-attachable forms. I could see nothing but a mere condition. Plants that would not cling, as it was said, at Dayton, Ohio, clung well enough for me after I brought them here. At Cleveland I was taken by some friends to see a kind that was said not to cling, and the grape-vine-like tendrils it was producing, freely commented on. But I pointed out a branch that had found out an old post for a friend, which was climbing by disk-attachment. There is about the same relation between these two forms as between *Rhus radicans* and *Rhus Toxicodendron*, when there is something it likes to attach itself to, it suits its habits to the fact,—and does not when the circumstances are repugnant. We might with as much reason say there are three forms of *Ampelopsis*,—for when it finds a dead tree to run on, it throws out a mass of annual rootlets along the stem, precisely as *Rhus radicans* does. It would probably do so under other conditions, though I only remember the rootlets on these rotten trees. That there are variations worth noting as distinct varieties, I have long thought probable. The Horse-chestnut-like foliage common to the *Ampelopsis* as we see it along the great lakes, impresses one at a glance as being distinct from the narrower, and less regularly toothed forms further south.

THOMAS MEEHAN.

Botanical Notes.

Hooker's Icones Plantarum, the third series, now being published by means of a legacy left for the purpose by Mr. Bentham, are to be edited hereafter by Professor Daniel Oliver. Vol. xi. is devoted to Indian orchids, Vol. x. being in course of publication at the same time. Only 250 copies are printed, and it would be well for American libraries to secure the work before the edition is exhausted, after which this valuable serial will be difficult to obtain. The subscription price is very low, considering the expense of drawing and engraving, 100 plates of new or rare plants being produced annually.

Reviews of Foreign Literature.

Monographia Juncacearum. Franz Buchenau. Engler's Bot. Jahrb., XII 1-495, (mit Tafel I-III und 9 Holzschnitten). 1890.

Pages 1 to 5 contain a description of the order, references to the principal literature, and an analytical key to the nine genera.

Pages 1 to 60 make up a comparative account of the Juncaceæ, each organ and each relationship being discussed in detail. Especially noteworthy among these observations are those on vicarious species and genealogical relationship. A list of twenty pairs or groups of species is given, in which the members of each group are closely related, but have separate, often widely separate geographical range. *Marsippospermum*, *Rostkovia*, and the several sub-genera of *Luzula* and *Juncus* have been derived, it is believed, from a type form similar to the "Junci poiophylli," of which *J. bufonius* and *J. tenuis* are examples. It is to be noted that the genera *Marsippospermum* and *Rostkovia* are represented as branching from subgenera of *Juncus*. The author, therefore, does not consider that groups of species, in order to be entitled to separate generic rank, must possess co-ordinate differentiation; but that one existing genus may have been derived from a form belonging to another existing genus.

Pages 60 to 463 contain the systematic part proper of the monograph. Of the nine genera, *Distichia*, *Patosia* and *Oxychloë*, are confined to the mountains of South America; *Marsippospermum* and *Rostkovia* to New Zealand, southern South America and the adjacent islands; *Prionium* to the Cape of Good Hope; *Luzula* and *Juncus* are widely distributed, and *Thurnia*, doubtfully classed with the Juncaceæ, is found only in British Guiana.

The number of species in each genus is as follows:

	Total.	North American, north of Mexico.	Mexican, additional.
Distichia,	3	0	0
Patosia,	1	0	0
Oxychloë,	1	0	0
Marsippospermum,	2	0	0
Rostkovia,	1	0	0
Prionium,	1	0	0
Luzula,	51	8 (besides *L. Carolinæ*)	3
Juncus,	176	65	3
Thurnia,	2	0	0

Of these species of *Luzula*, two are new to North America, *L. glabrata*, Desv. (Rocky Mountains, Lyall, Howell), and *L. confusa*, Lindenberg.(White Mountains, etc.) This White Mountain plant has been called *L. arcuata*, but that is found only farther north. *L. divaricata*, Watson, is referred to *L. parviflora*, Desv., and *L. spadicea* of American authors and its varieties become *L. parviflora*, Desv., the true *L. spadicea*, DC., not being credited to America. *L. Carolinæ*, Watson, is quoted with the original description and the note "Planta mihi ignota, caruncula deficiente a *L. pilosâ* valde diversa videtur" added, but the species is not numbered with the rest.

The greater part of the monograph, pp. 167–463, is devoted to *Juncus*. The genus is separated into eight sub-generic groups: Subulati, Poiophylli, Genuini, Thalassici, Septati, Alpini, Singulares, Graminifolii, of which all but two, Subulati and Singulares, are represented in North America. The group Ensifolii of Engelmann is included in the Septati.

The new species and the changes of specific names from the current American nomenclature are condensed into the following table. The species, as recognized by Buchenau, are printed in Roman type, the synonyms in italics.

Juncus Mexicanus, Willdenow = *J. compressus*, H.B.K.
" acutus sphaerocarpus, Engelmann = *J. robustus*, Watson.
" brachycephalus Buchenau, n. sp. = *J. Canadensis brachycephalus*, Engelm.
" trigonocarpus, Steudel = *J. caudatus*, Chapman.
" ensifolius, Wikström = *J. xiphioides triandrus*, Engelm. in part.
" Engelmanni, Buchenau = *J. scirpoides polycephalus*, " " "
" crassifolius, Buchenau, n. sp.= " " " " "
" dubius, Engelmann = " *J. rugulosus*, Engelmann.
" paucicapitatus, Buchenau, n. sp. = a Sitkan plant collected by Mertens.
" lamprocarpus, Ehrhart, = *J. articulatus*, L.
" Regelii, Buchenau, n. sp. = Suksdorf, No. 678, (1885); M. E. Jones, *J. longistylis latifolius*, without number and No. 1199, (Utah).
" latifolius, Buchenau, n. sp. = *J. longistylis latifolius*, Engelm.

In addition several changes in the disposition of varieties and their names are made, and a few of the species are arranged so as to show relationships different from those indicated by Engelmann. In only one case (that of *Juncus rugulosus*) has one of

Engelmann's species been referred to a species previously described. *Juncus Breweri*, Engelmann, is, however, considered doubtfully distinct from *J. Leseurii*.

At the end of the monograph, pp. 468 to 487, is given in tabular form the names as recognized by the author, of all the Junci exsicatti to be found in accessible herbaria.

The nomenclature adopted by the author varies somewhat from that followed by the leading botanists and other naturalists in this country. For example, if a species includes two or more forms, Buchenau usually gives to the form that was the type a varietal name, commonly var. *genuinus*. The custom followed by Gray, and now by almost all naturalists, is to allow the name of the species to stand for the form originally described, and to add varietal names only to forms subsequently described.

Juncus leptocaulis, Torrey and Gray, still retained by Buchenau, should be *J. filipendulus*, as pointed out by Britton.

Another point in nomenclature at variance with American custom is illustrated by the total loss of the Linnæan name *Juncus articulatus*. The species as originally described has been separated into two; and instead of adopting the Linnæan name for one of them, two later names are taken up.

As a whole, the work forms a very valuable working basis to the study of North American Juncaceæ, as it is the best present summary of our general knowledge of the group.

F. V. COVILLE.

Histology and Physiology of the Characeæ.—The "Botanisches Centralblatt," Vol. 44, Nos. 1 and 2, contains an article with the above title, written by Dr. Overton in the University of Zürich. The work is only fragmentary, being parts of results of experiments not yet finished. It was begun with the aim to discover the nature and function of the peculiar little bodies known in German as wimperkœrperchen, ciliated bodies, which float about with the rotating protoplasm; also with the hope that by following closely the processes concerned in the development of the spores, some light might be thrown on the relationship of this group to others, and some points obtained regarding the morphological signification of the central canal cell of the Archegoniata.

In regard to this hope the author says the obstacles to overcome were greater than he had supposed, and that so far, he has been able to ascertain very little with definite certainty. After giving the method of studying the fertilization of the egg and explaining the difficulties in the way of following the successive steps of development, he says that the commonly received opinion that the outer membrane of the spore, on ripening, becomes lignified is entirely without support. His experiments proved conclusively that this membrane is cuticularized or suberized, but never lignified. In describing the markings of the shell of these spores, he says it is quite possible to decide the various species by the difference of these markings.

In regard to the wimperkœrperchen the results were more satisfactory. Even here no conclusion as to their function was reached. The plant which served as material for this part of the work was *Nitella syncarpa* and was taken from the Zürich lake. These bodies were found in cells of nearly all parts of the plant but especially in the long internodal cells of the main portion. They were found to consist of albuminous matter and tannin. Other bodies occurring in the same cells are described as having the appearance of clear bubbles, some of which are as large as the ciliated bodies. Both of these structures, he says, have been mistaken for the cell nucleus, and states that much uncertainty in reference to their origin, nature and function has hitherto existed. He claims that they are in no way related to the cell nucleus, but that the so-called bubbles have the same chemical composition as that of the ciliated bodies, and that probably the latter are merely developed stages of the former. As proof of this he mentions that transition stages of various kinds were seen, and adds, that as the ciliated bodies were not found in the act of division, it is quite probable that they multiply only while in the form of bubbles, afterwards developing into the full-fledged body.

In regard to their behavior towards reagents and coloring matters, they are not unlike the protein grains found in Ricinus seeds. The fact that they are found in very young cells, where chlorophyll grains have only just made their appearance, being few in number and only slightly colored, suggests the possibility of their connection with the process of assimilation. On the

other hand, as they occur so frequently and in such great numbers in old cells which are in the process of dissolution, the inference here is that they play no part in the nutritive processes of the plant. It is somewhat singular that while they were found in such abundance in the *Nitella* plants, in all the different species of *Chara* used in the course of these experiments no wimper kœrperchen were seen.

E. L. G.

Statistics of the Fertilization of Flowers.—In the "Verhandlungen des Botanischen Vereins der Provinz Bradenburgh" xxxi, 1-63, is an article by E. Loew on "Blütenbiologischen Statistik." In this he gives the results of his investigations, in which he followed the method of Herman Müller in his work on the fertilization of flowers by insects.

This method was that of actually counting the visits of insects to flowers, made in such a manner as to secure the fertilization of one flower by the pollen from another. Müller records 10,000 instances of this kind counted by himself, and by a comparison of Alpine flowers and insects with those of north and middle Germany he reached the following conclusion; that the ancestors of certain Alpine flowers, such as *Viola calcarata*, *Rhinanthus alpinus*, &c., &c., must have emigrated from Germany into the Alpine regions as bee or humming bird flowers; that is, flowers adapted to fertilization by means of bees or humming birds, and these gradually changed their morphology so as to become butterfly flowers, owing to the much greater number of butterflies in that region than of bees or humming birds.

Loew says of this conclusion, that in the minds of certain biologists, Müller's keenness of reasoning has caused a distrust of his method of work, therefore it seemed to him important to repeat the work of Müller under circumstances differing as widely as possible from those surrounding the plants studied by the latter. This he did by using the same method on plants growing in the botanical garden in Berlin, for a series of years. In this manner the conduct of insects, similar to those of Westphalia and Thuringen, could be observed in regard to flowers of all possible origin. The author, after giving several tables showing the number of visits as actually counted, says the results confirm the con-

clusions reached by Müller. He follows these statements by similar tables made during a series of years in different localities; he also gives the results obtained by McLeod in Ghent and by Lindmann in other northern regions.

As all of these results point in the same direction, except in certain instances which admit of a reasonable explanation, he says the mutual dependence of these plants and animals can best be expressed as follows: Those insects and flowers which theoretically may be considered as influencing each other in respect to their mutual adaptation to this method of fertilization are those which in reality do influence each other the most strongly.

This expression, he says, is the same as that stated by Müller, though in somewhat different terms, and adds, that it has not yet been confirmed by actual statistics, but when this has been done a very important biological law will have been discovered, and one which will serve to make clear other points now in obscurity. His work in the botanical garden of Berlin was undertaken to prove that Müller's general methods were trustworthy, but he prefers another method of classification of flowers and flower-fertilizing insects, and for this reason he purposely selected a limited territory for his field of observation, as in this way the worth of his classification would best be made evident.

In order to see how his particular method applied to larger stretches of country, other observations were made at different intervals, in various localities and the results arranged in a similar manner; finally he states that the comparison of all the observations so far made, lead to the probability of the truth of Müller's conclusion, and that further work in this same manner is necessary to establish this conclusion as a fact.

E. L. G.

Note sur un Nouveau Parasite dangereux de la Vigne. (*Uredo Vialæ, sp. nov*). M. de Lagerheim, Professeur a l'Université de Quito (Equateur). Rev. Gen. de Bot. 15 Sept., 1890.

Uredo Vialæ, a new fungus destructive to Grape Vines, was found on the leaves of a Vitis near a country house between Kingston and Rockfort on the Island of Jamaica and is named in honor of M. Pierre Viala of the National School of Agriculture at Montpellier.

It must not be confused with *Uredo Vitis*, Thümen, which latter, according to M. Viala, is neither an Uredo nor even a fungus. The specimens distributed under that name among the exsiccatæ of Von Thümen are identical with the original specimens of Ravenel in the herbarium at Philadelphia and in that of Curtis at Cambridge. The cause of the error "is an affection common enough on vines planted on the sands of the sea shore and is a of physiological and accidental nature. The cells of the epidermis undergoing a change are isolated by desiccation, and, on account of their reddish color, might easily in a superficial examination be taken for the spores of an *Uredo*."

Uredo Vialæ is therefore the first of the Uredineæ known on a Vitis with any degree of certainty.

Von Thümen reports no less than 323 species of fungus parasitical on *Vitis vinifera* alone and as many of the most destructive of them in Europe have come from America, this note on the subject is a warning to agriculturists to be on the lookout for another enemy.

A second new species of Uredo very closely resembling *U. Vialæ* was found by M. de Lagerheim in the neighborhood of Quito on the leaves of *Cissus rhombifolia*, Vahl? and is described provisionally under the name of *Uredo Cissi*.

A. M. V.

British Moss Flora, II. Part XIII. R. Braithwaite. (London, Aug. 1890, pp. 105–144; t. LXI–LXVI.)

This fine work continues to improve in the illustrations, which in this part are excellent. Of the species figured there are 17 American as follows: *Splachnum ampullaceum*, L., *S. vasculosum*, L., *Tetraplodon bryoides*, (Zoega) Lindb. (*T. mnioides*, Br. Sch.); *T. angustatus*, (Sw.) Br. Sch., *Tayloria lingulata*, (Dicks.) Lindb. (*Dissodon splachnoides*, Grev.); *Discelium nudum*, (Dicks.) Brid., *Amblyodon dealbatus*, (Dicks.) P. Beauv., *Nanomitrium tenerum*, (Bruch) Lindb., *Physcomitrella patens*, (Hedw.) Br. Sch., *Physcomitrium pyriforme*, (L.) Brid., *Funaria attenuata*, (Dicks.) Lindb., (*Entosthodon Templetoni*, Schwaegr.); *Funaria calcarea*, Wahlenb. including *F. Mediterranea*, Lindb., *F. microstoma*, Br. Sch., *F. hygrometrica*, (L.) Sibth., *Oreas Mielichhoferi*,

(Funck) Brid. (*Mielichhoferia nitida*, Hornsch.); *Leptobryum pyriforme*, (L.) Wils. and *Pohlia acuminata*, Hornsch. (*Webera acuminata*, Schimp). We commend this work to students of American mosses, for its conscientious historical research and concise descriptions. E. G. B.

Monographie der Gattung Stylosanthes. P. Taubert. (Verhand. Bot. Ver. Brandenburg, xxxii. Reprinted).

This is the first time since the publication of De Candolle's Prodromus Vol. ii, in 1825, that the species of this Leguminous genus have been treated of collectively. Herr Taubert now recognizes 22. Of these two are North American: *T. biflora* (L.) B. S. P. (*S. elatior*, Sw.; *Trifolium biflorum*, L.) the binomial attributed by the author to himself, probably not being informed of the fact that it was used in 1888 by the authors of the Preliminary Catalogue of Plants growing within one hundred miles of New York, and *S. hamata* (L.), Taub. (*S. procumbens*, Sw.; *Hedysarum hamatum*, L.), the latter a common West Indian plant, occurring also in Florida and including, according to him, Curtis No. 609 from Tennessee. *S. Schaffneri* from Mexico, *S. sympodialis* from Ecuador and *S. Pohliana* from Brazil are described as new. Of the 22 species, only five occur in the Old World. Herr Taubert, it will be noticed, maintains the earliest specific names. N. L. B.

Index to Recent Literature on North American Botany.

Abies Fraseri. (Gard. Chron. viii. 684, 685, fig. 132).

Abrus præcatorius.—Ueber. Prof. Kobert. (Sitzungsb. Naturf. Gesell. Dorpat, ix. 114–117).

Araucaria imbricata. (Gard. Chron. viii. 587, 588, figs. 117, 118 also full page illustration).

Aristolochia grandiflora. (Gard. & For. iii. 596, figs. 78-80).

This remarkable plant, native of the West Indies and tropical America generally, has recently flowered at the nursery of Mr. E. D. Sturtevant, at Bordentown, N. J. The flowers are among the largest of any known, one reaching the extraordinary dimensions of twelve by eighteen inches, with forty-two inches of tail, or a total length of five feet.

Bilbergia thyrsoidea, Mart. L. Wittmack. (Gartenflora, xxxviii. t. 1291).

Native of Brazil.

Biographical Sketch of J. B. Ellis. F. W. Anderson. (Bot. Gaz. xv. 299-304, with portrait).

California White Oak—The. (Garden & Forest, iii. 606, illustrated).

Description and picture of *Quercus lobata.*

Carica Papaya—Frucht in Frucht von. Fritz Muller. (Flora, 1890, 332-333).

Caryocar Brasiliense. Eug. Warming. (Vidensk. Meddel. Naturhis. For. Kjobenhavn, 1890, 45-48; one plate).

Cascara Sagrada and its Allies. H. H. Rusby. (Druggists' Bull., Oct., 1890, ten figures. Reprint, pp. 8).

This is a discussion of the West American species of *Rhamnus.* The drug bearing the above name is derived from the bark of *R. Purshiana.* Dr. Rusby maintains that it is clearly distinct from *R. Californica,* which it most nearly resembles, and that *R. tomentella,* Benth., *R. occidentalis,* Howell, and *R. rubra,* Greene, are also probably distinct.

Cattleya Schilleriana, Reichenb. F. E. Ortgies. (Gartenflora, xxxviii. 33, t. 1290).

Native of Brazil.

Contributions to the Life-histories of Plants. V. Thomas Meehan. (Proc. Acad. Nat. Sci. Phila., 1890, 266-277. Reprinted).

This number of Mr. Meehan's interesting series contains notes "On the anthers of *Lappa major;* "The Pollination of *Crucianella stylosa*;" "On Unisexuality in connection with the Order of Flowering in Willows;" "On the Varying Character of Dichogamy in Flowers of *Corylus Avellana*;" "Diœcism in Labiatæ;" "Self-fertilizing Flowers;" "On the Male and Hermaphrodite Flowers of *Æsculus parviflora*" and "On the Direction of the Spiral Twist in the leaves of the Norway spruce."

Eucharis Lehmanni, Regel. E. Regel. (Gartenflora, xxxviii. t. 1300).

A new Amaryllid from Columbia.

Euonymus obovatus, Nutt. H. Zabel. (Gartenflora, xxxviii. 638-640).

A discussion of this species, maintaining it to be distinct from *E. Americanus.*

Field Notes from the Colorado Desert. C. R. Orcutt. (Garden & Forest, iii. 558, 559).

Formation of Travertine and Silicious Sinter by the Vegetation of Hot Springs. Walter H. Weed. (U. S. Geol. Surv., Ninth Ann. Rep., 619-676, illustrated. Also reprinted).

The author begins by calling attention to the fact that the influence of plant life in building up certain formations is frequently ignored, for the reason that it is only by a careful study of such formations while in actual process of construction that an adequate idea of this influence can be gained. It is no doubt for this reason that the subject has been heretofore neglected, and the author has taken full advantage of a comparatively unexplored field of investigation. The facts upon which this article is based were gathered in the Yellowstone region, but a general review of the literature of thermal spring vegetation precedes the author's own observations. This vegetation is entirely algal, and in the Yellowstone region, does not occur at a temperature above 185° Far. Although this vegetation has been frequently noted and studied to a greater or less extent, its importance in the formation of hot spring deposits does not seem to have received the attention which it deserves. Not only do the plants become encrusted with the mineral matter, but by their abstraction of carbonic acid from the water they hasten the deposition of the carbonate of lime and thus become an important factor in the formation of travertine. In fact, proof is given that in certain places travertine would not form but for the presence of plant life. In only two instances was it found that vegetation was not either directly or indirectly concerned in its formation. Of the numerous forms of travertine none show the vegetable origin more clearly than the fibrous tufa forming fan-like masses. If a fragment of this is dissolved in hydrochloric acid it shows that each of the fibres is formed of a single encrusted alga filament. In the formation of silicious sinter, the algæ seem to act mostly by forming dams or other obstructions of gelatinous material, over which the sinter is deposited. Thus pillars are formed in the interior of pools and rims around the margins. The exact manner in which

the algæ eliminate the silica from solution does not seem to be known, but from what the author says, it is evident that he considers it due directly to the action of the plant's vitality in some way, and he says that both the filaments and their slimy coverings are formed of gelatinous silica. "In general, it may be stated that the large vase and pillar-forms found in the alga pools can be produced only by a concurrent life and death of these plants; the outer layers continually growing, the innermost dying." Besides the sinter formed from the jelly-like masses there are fibrous sinters formed by *Calothrix gypsophila* and *Leptothrix laminosa*. On the lower part of the slope, below the Madison Plateau, a moss (*Hypnum aduncum*, var. *gracilens*) seems to act as an agent in forming sinter, and we are told that "this sinter is not formed by evaporation * * * but is due to the abstraction of silica from the water by the mosses * *." The difference between the unaltered sinter, due to simple evaporation of the water and that due to the influence of vegetable life, is quite marked; the former being translucent or vitreous, while the latter is opaque and often chalk-like in appearance. Diatoms are abundant in the cooler waters and form the ooze of the geyser basin marshes. The author has certainly proved a far greater importance for plant life as a rock-building agent than we formerly knew of and it is quite possible that similar studies in other localities would yield equally interesting results.

A. H.

Gunnera.—Eine Brasilianische (*Gunnera manicata, Linden.*) W. Schwanke. (Engler's Bot. Jahrb. xii. Beiblatt nr. 28, 1-3, illustrated).

Hepaticæ Africanæ Novæ in Insulis Bourbon, Maurice et Madagascar lectæ. F. Stephani. (Bot. Gaz. xv. 281–292. Pl. XVII-XIX).

Twenty-three new species are described.

Hepaticæ—List of Canadian. W. H. Pearson. (Geol. and Nat. Hist. Surv. of Can. Montreal, 1890. Pamph. pp. 31, Pl. XII).

Professor Macoun is to be congratulated on having secured so competent and conservative a student as Mr. Pearson to work up his collections of Canadian liverworts, and we learn with pleasure that the only new species described, *Frullania Selwyn-*

iana, is dedicated to A. R. C. Selwyn, the Director of the Survey. Two of Austin's MSS. names are printed, and 165 species are enumerated. The plates are lithographed from drawings by the author, and notes by Dr. Spruce add interest to the list. A full index of names and synonyms, and a correct system of nomenclature, make this a memorable contribution to our knowledge of North American hepaticæ. E. G. B.

Hippeastrum reticulatum, Herb. L. Wittmack. (Gartenflora, xxxviii. t. 1297).

Native of southern Brazil.

Jamaica—Bulletin of the Botanical Department. December, 1890. Contains Part ii of the synoptical list of ferns and their allies, by G. S. Jenman.

Twenty-five species of the genus *Trichomanes* are enumerated.

Jamesia Americana, Torr. and Gray. H. Zabel. (Gartenflora, xxxviii. 103, 104; two figures).

Lakeside Daisy—The. Clarence M. Weed. (Journ. Columbus Hort. Soc. v. 72, 73, Pl. VI).

The discovery is reported from the Sandusky Peninsula, near Lakeside, Ohio, of *Actinella acaulis*, where it appears to be thoroughly established. This is certainly an interesting find and we should not now be surprised to hear of its discovery at other intermediate points between there and its ordinary habitat west of the Mississippi.

Leo Lesquereux.—Obituary Notice of. J. P. Lesley. (Proc. Amer. Philos. Soc. xxviii. 65–70).

Leucophyllum Texanum. (Garden & Forest, iii. 488, 489, fig. 63).

Lilium superbum. (Garden, xxviii, 506, 507; illustrated in text and with colored plate).

Liriodendron—Notes on the Leaves of. Theodor Holm. (Proc. U. S. Nat. Mus. xiii. 13-35; plates IV–IX; reprinted).

This paper consists of a detailed description of the leaves of the Tulip-tree, and a discussion of the relations of the several fossil (Cretaceous and Tertiary) species which have been described by Dr. Newberry (BULLETIN, xiv, 1—7), Lesquereux,

Heer, and other authors. Reasoning from the well-known variability of the foliage of *L. Tulipifera*, many forms of which are illustrated on the accompanying plates, Mr. Holm is inclined to maintain that the three species described by Dr. Newberry from the Amboy clays are forms of a single one; this hypothesis, indeed, appears to be the main object of the paper.

Mr. Holm's work indicates much research. He has, however, made one mistake, and that we believe a most serious one. We refer to the fact that he has not seen the specimens on which Dr. Newberry's paper was based, but has written all these pages on the information to be derived from the single figures of the three species alluded to. Since that paper was written an immense amount of additional material has been derived from the Amboy clays, and enough of *Liriodendron* to support the species indicaten in the original descriptions. If Mr. Holm had taken the trouble to come to New York we could have shown him more in *Liriodendron* than he has hitherto had opportunity to inspect.

N L. B.

Lonicera oblongifolia, Hook. and L. villosa, Muhl. H. Zabel. (Gartenflora, xxxviii. 526, 527).

Mamillaria Grusoni and Echinocactus Bolansis. E. Runge. (Gartenflora, xxxviii. 105, 106; two figures).

Two new Cacti from Coahuila, Mexico.

Masdevallia Chimæra, Reichb. f. G. Sommer. (Gartenflora, t. 1311).

Native of New Grenada.

Notes from a Garden Herbarium.—II. L. H. Bailey.

This article treats of raspberries and blackberries. *Rubus villosus, R. villosus*, var. *frondosus, R. neglectus* and *R. occidentalis* are figured and described and two new varieties of *R. villosus* are also described, viz.: var. *albinus*, founded on the creamy white fruit, and var. *sativus* which has larger, more globular fruit than the species. This latter is stated to be the parent of nearly all the cultivated varieties of high blackberries.

Notes on Rare East Tennessee Lichens. W. W. Calkins. (Am. Nat. xxiv. 1078, 1079).

Notes on the Flora of the Lake Superior Region.—III. E. J. Hill. (Bot. Gaz., xv. 304–311).

In this contribution the botanical features in the vicinity of Vermillion Lake, Minnesota, are described. *Caltha natans* is noted from the neighborhood of Tower.

Notes Sur le genre Trentepohlia, Martius. M. Paul Hariot. (Jour de Bot. Paris, 1 Nov. 1889,—16 Mai. 1890).

The following species occur in the United States: *Trentepohlia aurea* (L.), Martius; *Trentepohlia abietina* (Flotow), Hansgirg; *Trentepohlia effusa*, (Krempelhüber,) Hariot (*T. setifera*, Farlow); *Trentepohlia odorata* (Wiggers), Wittrock; *Trentepohlia rigidula* Müll. Arg.) Hariot. (*T. tortulosa*, Willdeman), might occur in the Southern United States.

Otacanthus, Lindl. und Irhe Verhältnis zu Tetraplacus, Radlk. —Die Gattung. P. Taubert. (Engler's Bot. Jahrb. xii. Beiblatt nr. 28, 11–16).

Pachystima Canbyi, A. Gray. H. Zabel. (Gartenflora, xxxviii. 138, 139).

This rare shrub of the Southern Alleghanies is in cultivation at the Garden at Münden, Germany; it is said to endure the winter well, but to grow very slowly.

Pinus ponderosa. (Gard. Chron. viii. 559, 558, fig. 110, 111, 114, 115).

Prairie Flowers of late Autumn. Byron D. Halsted. (Pop. Sci. Monthly, xxxviii. 229–236).

Prickly Lettuce.—An Introduced Weed. Miss F. Detmars. (Journ. Columbus Hort. Soc. v. 53, 54, Pl. iv).

From this article it is evident that *Lactuca Scariola* is becoming a troublesome weed in parts of Ohio.

Promising Wild Fruits.—III. A. A. Crozier. (Am. Garden, xi. 712–714, illustrated).

Consists of notes upon *Castanea Americana, C. pumila, Prunus serotina, P. Pennsylvanica, P. pumila, Rubus Chamæmorus, R. leucodermis and Asimina triloba*, the latter figured.

Pyrenomycetes, The North American: A Contribution to Mycologic Botany. By J. B. Ellis and B. M. Everhart, with original illustrations by F. W. Anderson. Published by Ellis and Everhart, Newfield, New Jersey, 1891.

We have been favored with the title-page and advance plates of this important contribution to the knowledge of North American Fungi. It is to contain about 600 pages and 41 plates, and will practically be a manual of the N. A. Pyrenomycetes. The arrangement will be in the main like that in Winter's Pilze, as being more natural than that of Saccardo. The plates are artistic as well as accurate, having been drawn in all cases from fresh material, and reflect much credit on Mr. Anderson for patience and skill.

Rhodostachys Andina. J. G. Baker. (Bot. Mag. T. 7148).

Scaphosepalum pulvinare. (Bot. Mag. T. 7151).

Shepherdia argentea und Elæagnus argentea. W. Siehe. (Gartenflora, xxxviii. 625–627, fig. 89).

Solidago speciosa. (Garden & Forest, iii. 560, fig. 74).

Supplement til St. Croix's og Jomfrusernes Flora. H. F. A. Eggers. (Vidensk. Medd. Naturhis. For. Kjobenhavn, 1890, 11–21).

An enumeration of species additional to the flora of the West Indian Island of St. Croix. *Vanilla aphylla* is described as new.

Symbolæ ad Floram Brasiliæ centralis cognoscendam. Eug. Warming. (Videnskab. Meddel. Naturhis. Foren. Kjobenhavn, 1889, 1–10; 22–44; 327–357; two plates).

These papers include an enumeration, with descriptions of new species, of the plants recently collected by Dr. A. Glaziou. The Sapotaceæ, contributed by C. Raunkier, include new species of *Mimusops*, *Sideroxylon*, *Lucuma* and *Chrysophyllum*, the Vochysiaceæ, by E. Warming, new species of *Vochysia;* the Scitamineæ by O. G. Petersen, new species of *Calathea*, *Maranta*, *Saranthe.* There are also citations of all Dr. Glaziou's numbers published in recent part of the Flora Brasiliensis, making a nearly complete record of the collections of this distinguished explorer in central Brazil. N. L. B.

Tigridia Pringlei, S. Wats. L. Wittmack (Gartenflora, xxxiii. 320–322; fig. 51).

Tillandsia streptophylla. L. Wittmack (Gartenflora, xxxviii. 288, 289; one figure).

Native of Central America.

Tupelo Tree—The. (Garden & Forest, iii. 485, 486, illustrated).

Includes a full page picture of typical trees of *Nyssa aquatica.*

Viburnum—Arten aus der Gruppe Lentago. Die Nordamerikanischen. H. Zabel. (Gartenflora, xxxviii, 461-463).

This is an account of some of our species of *Viburnum* as understood by Herr Zabel. A new variety *subpedunculatum* of *V. Lentago* is described, and also a supposed hybrid between *V. Lentago* and *V. nudum=V. Vetteri.* All these studies are based on garden specimens.

Washingtonia robusta, H. Wendl. L. Wittmack (Gartenflora, xxxviii. 300-302; one figure).

A description of this California palm as studied in cultivation.

Wild Carrot. Aug. D. Selby. (Journ. Columbus Hort. Soc. v. 70-72).

A brief history of references to *Daucus Carota* in local catalogues and quotations from laws enacted designed to prevent its spreading.

Yucca gloriosa. (Gard. Chron. viii, 692, fig. 136).

Zizania aquatica. L. Wittmack. (Gartenflora, xxxviii. 262-266; three figures).

Proceedings of the Club.

The regular meeting was held on December 8th, the President in the chair, and twenty-two persons present.

Miss Elizabeth Doughty and Mr. J. T. Kane were elected active members.

Dr. Eccles read the announced paper of the evening, "Notes on the Flora of the Western Desert." It was profusely illustrated by specimens and lantern slides.

Dr. Britton read a note just received from Prof. Conway Macmillan, announcing the discovery of *Salvinia natans* in a lake

near Minneapolis, Minn. He referred to its previous discovery in 1886 by Mr. C. H. Demetrio, in Missouri, (Bot. Gaz. xi. 46; BULLETIN xiii. 45), confirmed by Prof. Underwood at the Buffalo Meeting of the Botanical Club of the American Association for the Advancement of Science, (BULLETIN xiii. 171), and expressed regret that this was not considered sufficient proof of its occurrance in the Eastern United States, to cause its admission into the sixth edition of Gray's Manual of Botany.

Dr. Britton also announced that the *Clematis* collected by him at White Sulphur Springs, W. Va., in August was *C. ovata*, Pursh, as determined by a comparison made by Prof. S. H. Vines with the original specimen preserved at Oxford.

The annual meeting was held January 13th, the President in the chair, and twenty-six persons present.

Dr. R. H. Lamborn, Mr. M. M. LeBrun, Dr. Thos. Morong and Dr. J. Bernard Brinton were elected active members.

Mr. Edward L. Rand, Boston, Mass.; Mr. E. J. Hill, Engelwood, Ill.; Mr. Frank S. Collins, Malden, Mass.; Prof. Conway MacMillan, Minneapolis, Minn.; Mr. Merritt L. Fernald, Orono, Me.; Mr. Frank McDonald, Peoria, Ill.; Mr. L. N. Johnson, Evanston, Ill.; Prof. Chas. A. Davis, Alma, Mich., and Dr. Chas. B. Graves, New London, Conn., were elected corresponding members.

The reports of officers and standing committees for the past year were read and accepted.

The following officers were elected for the ensuing year: President, Hon. Addison Brown; Vice-President, Dr. T. F. Allen; Treasurer, Dr. Wm. E. Wheelock; Recording Secretary, Miss Maria O. Steele; Corresponding Secretary, Miss Helena C. Gaskin; Librarian, Mr. Maturin L. Delafield, Jr.; Curator, Miss Josephine E. Rogers; Editor, Dr. N. L. Britton; Associate Editors, Dr. Emily L. Gregory, Miss Anna Murray Vail, Prof. C. Henry Kain, Dr. H. H. Rusby, Mr. Arthur Hollick.

Dr. Morong read the announced paper, "The Asuncion Market," giving an interesting account of life and manners in Paraguay.

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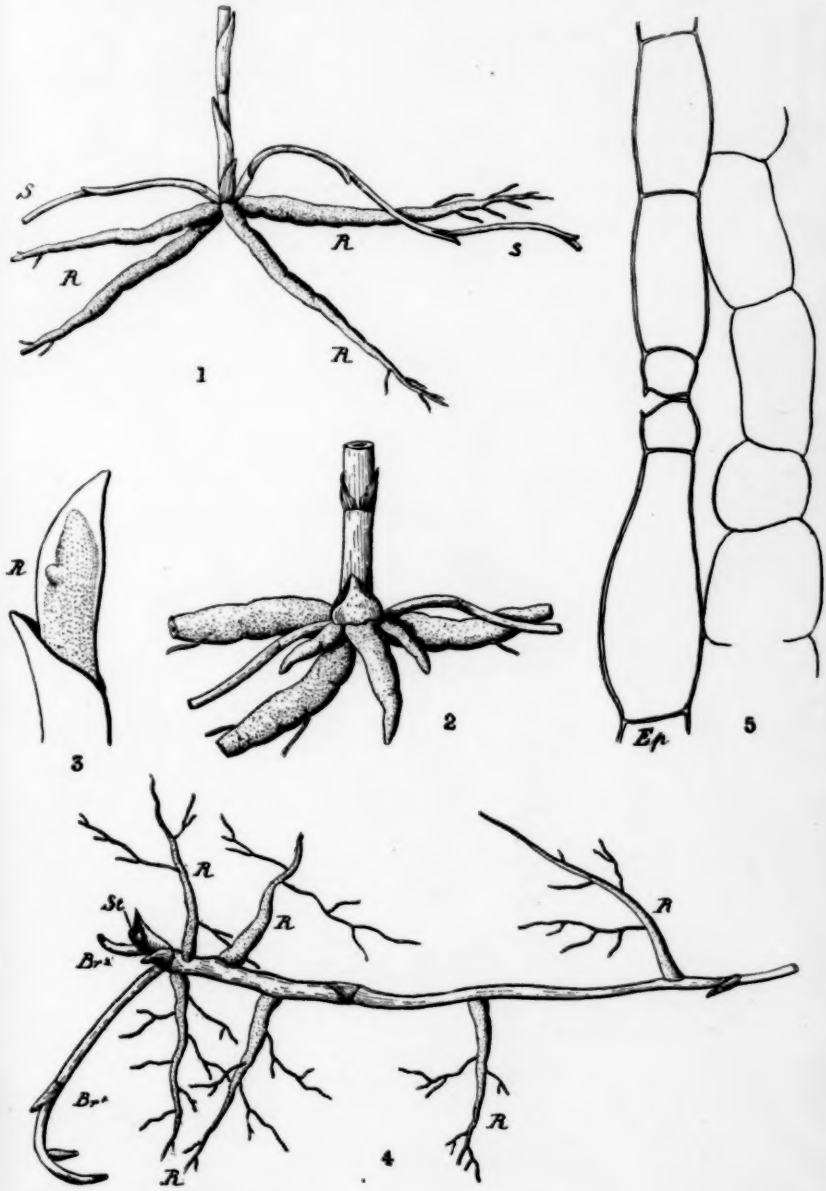

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Theo. Holm.—Rootstocks of Uvularia and Oakesia.

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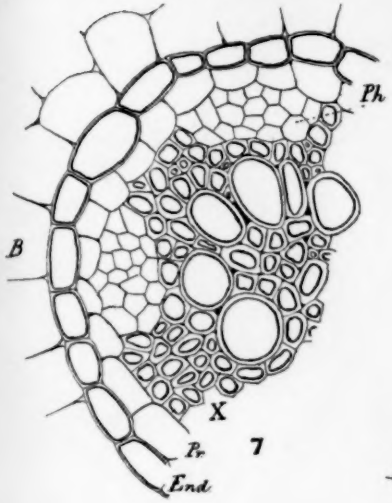

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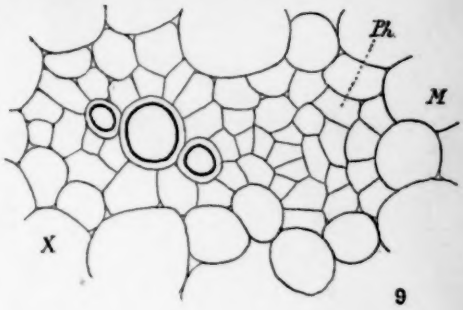

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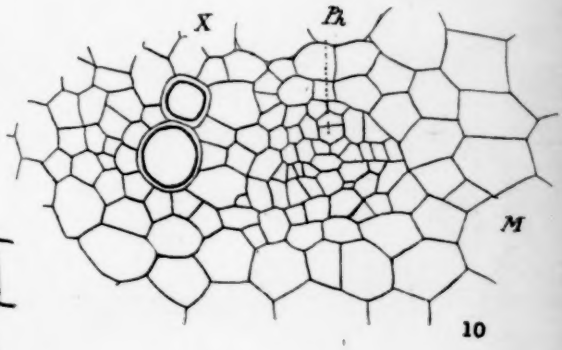

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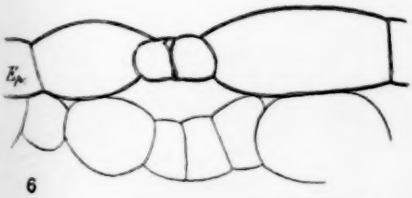

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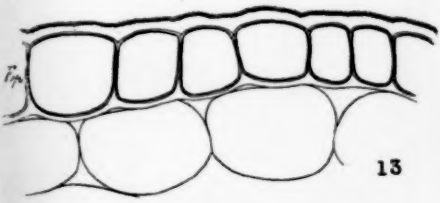

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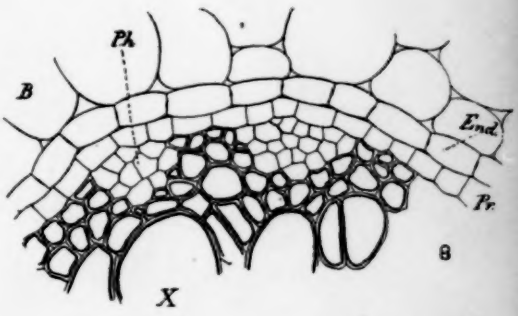

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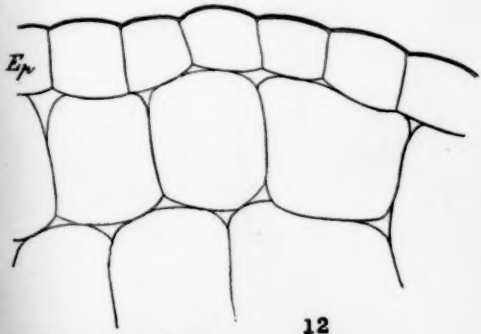

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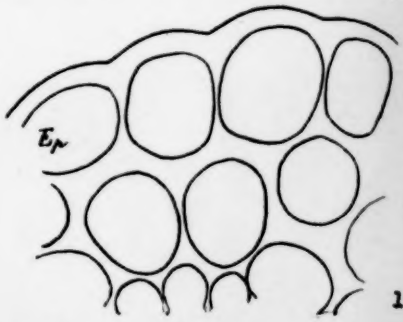

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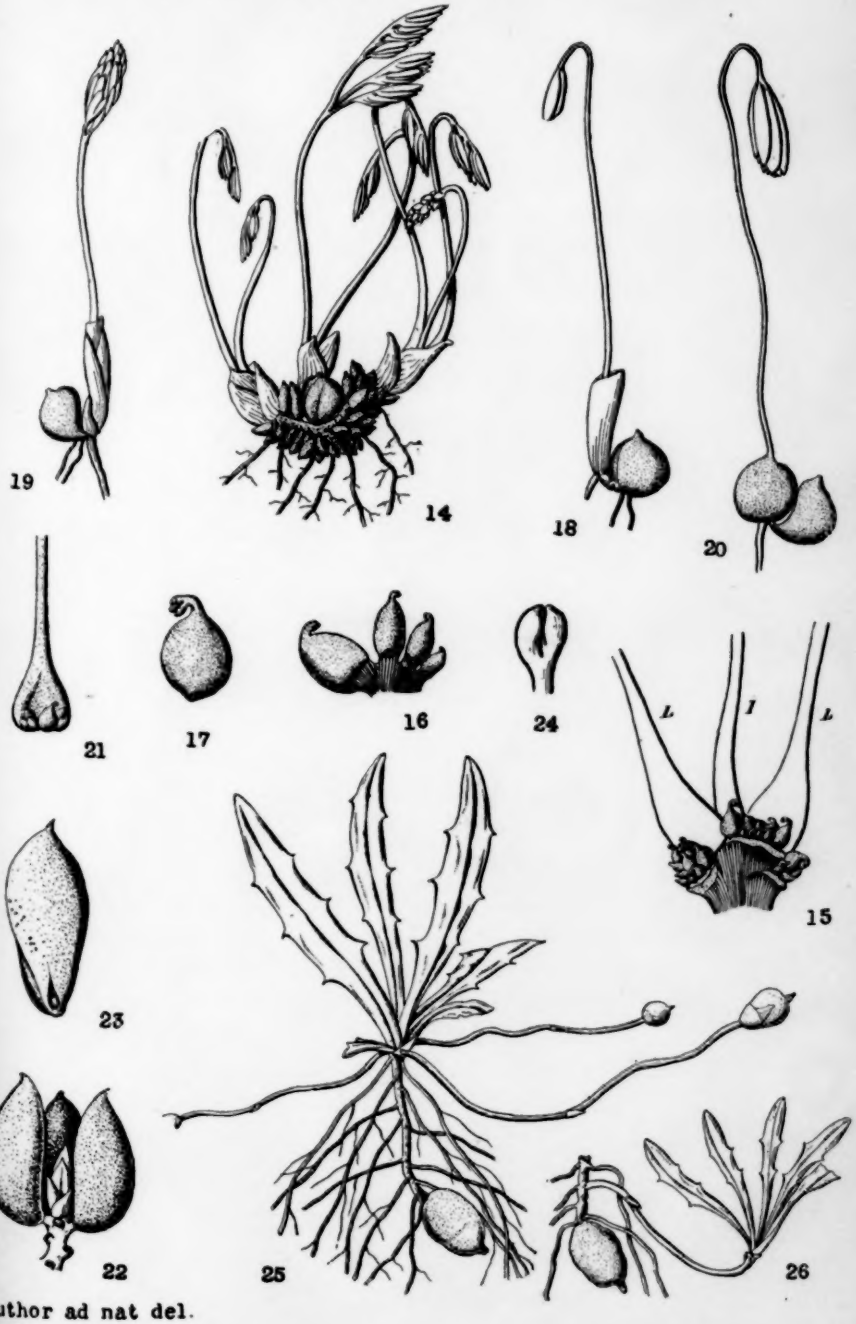

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